

Serial No. 09/768,301
Amdt. dated September 26, 2003
Reply to Office Action of March 26, 2003

Docket No. K-0254

REMARKS/ARGUMENTS

Favorable reconsideration and allowance of the present patent application are respectfully requested in view of the foregoing amendments and the following remarks. Claims 1-37 are pending in the application.

Specification Informalities

This Amendment addresses informalities in the specification noted by the Applicant. Further, amendments were made for consistency with the claim language and to clarify terms. For example, “backup disk” and “log disk” were changed to “persistent backup storage devices” and “persistent log storage devices”, and “backup data” to “checkpointed database”. Accordingly, approval of these changes is respectfully requested.

35 U.S.C. § 102 & 103 Rejections

Claims 1-36 were rejected under 35 U.S.C. § 103 (a) as allegedly being unpatentable over Bordsen et al. (U.S. Patent No. 5,193,162) in view of Bohannon et al. (U.S. Patent No. 6,449,623). Applicant respectfully traverses each of these rejections for at least the following reasons.

Embodiments of the present invention are directed to methods for logging updates and recovering from a system failure by logging differential update information in a plurality

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of log storage devices. These differential log records are generated by comparing before-update images and after-update images, and by using an XOR of the difference.

Accordingly, embodiments of the present invention maximize parallelism in both logging and recovery of the database by fully utilizing the XOR operation's commutative and associative property. The commutative and associative properties of the XOR operation enables processing of log records in an arbitrary order. This means that log records can be freely distributed to multiple log devices to improve the logging performance. During the recovery, each log device can be independently accessed for a parallel restart.

Regarding claim 1 as amended, Applicant respectfully submits that the Bordsen et al. reference does not teach or suggest "recovering from a failure by replaying the differential records in an arbitrary order, which is independent of the order of generation of the log records, by using bit-wise XOR operations", as recited in claim 1. That is, the Bordsen et al. reference fails to teach the XOR's order-independent log processing property.

Additionally, the Bordsen et al. reference fails to disclose the parallelism in logging and recovery which is recited in "parallel logging and parallel recovery" and "distributing the generated differential log records in parallel" of claim 1. To the contrary, the Bordsen et al. reference teaches, in column 12, lines 12-28, to have duplicate memories that contain the same data in case of a failure of one of the memories. It is clear that simply using multiple redundant log devices without the parallel logging and recovery as claimed would not provide any

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performance gain in the logging or recovery time and does not teach or suggest Applicant's claimed combinations.

Further, claim 1 as amended claims that multiple log volumes are considered while the Bordsen et al. reference discloses only a single log volume. Also, claim 1 recites "replaying the differential records in an arbitrary order which is independent of the order of generation of the log records" and "distributing the generated differential log records in parallel to said persistent log storage devices". Accordingly, the log records can be freely distributed to an arbitrary number of log devices. Still further, the log records can be processed in parallel for each log device during the recovery. These features are also not disclosed in the Bordsen et al. reference at least due to the fact that the Bordsen et al. reference fails to disclose parallel recovery and parallel logging in an arbitrary order.

As stated in MPEP § 2143.01, to establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 165 USPQ 494, 496 (CCPA 1970). The Bordsen et al. reference as applied by the Examiner fails to disclose the features of Applicant's claimed combinations as noted above. Therefore, this reference does not render Applicant's claimed combinations obvious as alleged by the Examiner. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this rejection.

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Further, Applicant respectfully submits that the Bohannon et al. reference as applied does not cure the above noted deficiencies and that one of ordinary skill in the art would not have been motivated to modify the systems of Bordsen et al. and Bohannon et al. to arrive at Applicant's claimed combinations absent impermissible hindsight reference to Applicant's specification.

The remaining independent claims (i.e., claims 24 and 34) recite related subject matter to the above-identified independent claim 1, and are therefore allowable for reasons similar to those given above.

The dependent claims are allowable at least by virtue of their dependency on the above-identified independent claims. See MPEP § 2143.01. Moreover, these claims recite additional subject matter, which is not suggested by the documents taken either alone or in combination. For instance, additional features of parallelism during the recovery have been recited in claims 11, 13, 14, 15, 17, 20, 21, 22, and 23, which are achieved by fully utilizing the XOR's order-independent log processing property.

CONCLUSION

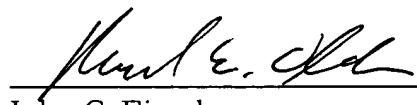
If the Examiner believes that any additional changes would place the application in better condition for allowance or has any questions regarding the foregoing amendment, the Examiner is invited to contact the undersigned attorney, Mark E. Olds at the telephone number listed below.

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To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 16-0607 and please credit any excess fees to such deposit account.

Respectfully submitted,
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